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08/960,224	10/29/1997	SHINICHI NISHIDA	Q46916	5658

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 08/960,224	Applicant(s) NISHIDA ET AL.	
	Examin r Mike Qi	Art Unit 2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over the article "Principles and characteristics of Electro-Optical Behaviour with In-plane Switching Mode" (Oh-e et al) in view of US 5,085,973 (Shimizu et al) and US 4,632,514 (Ogawa et al).

Claim 1, Oh-e et al discloses (in the paragraph "Principles of Proposed In-plane Switching Mode" and Fig. 1) an In-Plane Switching mode liquid crystal display comprising:

- a first substrate and a second substrate opposed to each other;
- when a predetermined voltage is applied, the predetermined electric filed will be generated on the second substrate;
- a liquid crystal layer injected in a gap between the pair of substrates;
- the electric field generated by the second substrate being substantially parallel to the liquid crystal layer to control the display;
- a plurality of opposing electrodes provided in parallel to the pixel electrodes, so that when

a voltage is applied to the pixel electrodes to generate an electric field therebetween.

Oh-e does not expressly disclose that the first substrate on which a plurality of color layers having transmission wavelengths different from each other are provided in parallel to each other, and the liquid crystal layer having a thickness which varies depending upon the transmission wavelengths of the color layers; the second substrate on which a plurality of pixel electrodes provided corresponding the color layer, and the predetermined voltage being applied to the pixel electrode, and maximum brightness for each of R,G,B is gained by applying different driving voltages to the pixel electrodes depending on the thickness of the liquid crystal layers in each color layers, wherein larger voltage is applied to each of the pixel electrodes for the color layers with thinner liquid crystal layer to get maximum brightness for each color.

However, Shimizu discloses (col.1, line 45 - col.2, line 33; Fig.1) that a liquid crystal panel comprising a first substrate (1) on which a plurality of color filters (2) (red, green and blue, corresponding to the different wavelengths) having transmission wavelengths different from each other are provided in parallel to each other, and the liquid crystal layer having a thickness which varies depending upon the transmission wavelengths of the color filters, so as to improve the contrast, and this is "multi-gap", and the color filter can give a pattern having a high precision and an excellent surface smoothness and has a good environmental resistance, so that means the coloring is controlled in a case of an oblique view or front view will have a good environmental resistance and a wide viewing angle.

Ogawa discloses (col.7, line 3 - col.8, line 7; col.9, line 48 - col. 10, line 26; Fig.15) that in the relative thick cell, there is a undesirable phenomenon that the transmittance decreases as impressed voltage increased. Therefore, in the thick cell, the impressed voltage must be decreased in order to increase the transmittance. Therefore, the applied driving voltages to the pixel electrodes must be decreased as the cell thickness being increased in order to increase the brightness, and that would be applying driving voltages to the pixel electrodes are depending upon the thickness of the crystal layers in each coloe layer, wherein the applied driving voltages to each coloe pixel electrode are increased as the thickness of the liquid crystal layer of each coloe pixel layer being decreased for achieving maximum brightness of each color (i.e., larger voltage is applied to each of the pixel electrodes for the color layers with thinner liquid crystal layer ti get maximum brightness for each color).

Ogawa discloses the concept for the multi-gap type liquid crystal cell in which applying different driving voltage to the pixel electrodes depending upon the different thickness of liquid crystal layer in each color layer , wherein the applied driving voltages to each coloe pixel electrode are increased as the thickness of the liquid crystal layer of each coloe pixel layer being decreased for achieving maximum brightness of each color.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made in which the thickness of the liquid crystal layer varies depending upon the different wavelengths of the color layers as claimed in claim 1 to achieve a good environmental resistance

and a wide viewing angle and gained maximum brightness by applying different driving voltage as taught by Shimizu and Ogawa.

Claim 2, Shimizu discloses (Fig.1) that the thickness of the liquid crystal layer increases in proportional to the wavelength of the corresponding color filter, i.e., the thickness of the liquid crystal layer increases in proportion to the wavelength from blue (460 nm) to red (650 nm), and the function of the color filter must be able to passing light 70% or more of peak of incoming light, so as to improve the contrast.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange the thickness of the liquid crystal layer increases in proportional to the wavelength of the corresponding color filter, and the light transmission factors of the color filter higher than 70% of peak of incoming light as claimed in claim 2 for achieving the contrast requirement.

3. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,137,560 (Utsumi et al).

Claim 3, Utsumi discloses (col.3, line 3-col.4 line 53; col.8, line 24-col.14, line 9; and Figs.1, 6, 20, 21) that an active matrix liquid crystal display panel comprising:

- a plurality of color filters (14) on a first substrate (7);
- a second substrate opposing to the first substrate and the liquid crystal layer (6) formed between the two substrates;

- the second substrate having a plurality of pixel electrodes (3, 4) corresponding to the color filters and a plurality of common electrodes (1) generating a parallel electric field to the liquid crystal layer to control a display when voltage is applied to the pixel electrodes;
- the thickness of the liquid crystal layer at a portion where red light transmitting is thinner than the thickness of the liquid crystal layer at a portion where green light or blue light transmitting (col.4, lines 49-53), i.e., the liquid crystal layer having a thickness which varies depending upon the transmission wavelength of the color layer;
- the pixel electrodes (3, 4) and the opposing common electrodes (1) being spaced each other by distances.

Utsumi discloses (col.11, lines 25-43) an In-Plane switching mode liquid crystal display having the thickness of the liquid crystal layer being varied and corresponding color filters.

Although Utsumi fails to explicitly disclose the last limitation of claim 3, but Utsumi discloses (col.11, lines 25-43; Fig.6) the IPS display device comprising color filters (R,B,G) corresponding to the pixel electrodes. Since each of the pixel electrodes is corresponding to a
CF ~ cT (spaced by different distance) cF px cT
different color filter (i.e., R, B or G), so that the respective pixel electrodes and the opposing common electrodes being spaced from each other by distances which are different for the individual color filters (different color filter having corresponding different pixel electrode, so that the distance between the pixel electrode and the common electrode also is different corresponding to each color filter). Utsumi indicates (col.5, lines 33 - 67) that such structure

would suppress the sudden decrease of the transmittance at the short wavekengh region or the blue region and obtaining the fine display charaterstic.

Therefore, it would have been obvious to those skilled in the art at the time the invention was amde to arrange the pixel electrodes as claimed in claim 3 for achieving the fine display characteristic.

4. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,137,560 (Utsumi et al) in view of US 5,085,973 (Shimizu et al).

Claim 5, Utsumi discloses all the limitations of claim 5 as the explanation above except for the liquid crystal layer has a thickness which is increased in proportion to one wavelength selected from a wavelength region in which transmission factors of the color layer are higher than 70% of those at peaks of transmission spectra of the color layers.

However, Shimizu discloses (col.1, lines 45-48; Fig.1) that the thickness of the liquid crystal layer increases in proportional to the wavelength of the corresponding color filter, i.e., the thickness of the liquid crystal layer increases in proportion to the wavelength from blue (460 nm) to red (650 nm) for the purpose of improving contrast, and the function of the color filter must be able to passing light 70% or more of peak of incoming light, so as to improve the contrast.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange the thickness of the liquid crystal layer increases in proportional to the wavelength of the corresponding color filter, and the light transmission factors of the color filter

higher than 70% of peak of incoming light as claimed in claim 5 for achieving the contrast requirement.

Claims 4 and 6, Utsumi discloses (Col.10, lines 40-41 and Fig.6) that a surface flattening protection film (25) is provided on the color filter (24), and it was common and known in the art to arrange a protective layer on the color layers as claimed in claims 4 and 6 for preventing elusion of impurities from the color layers.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,137,560 (Utsumi et al) in view of US 5,506,706 (Yamahara et al).

Claim 7, Utsumi discloses all the limitations of claim 7 as the explanation above except for a pair of polarizing plates and an optical compensation layer.

However, Yamahara discloses (col.3, lines 30-57; col.5, lines 30-31; and Figs. 2, 4) that a pair of polarizing plates (3 and 4) disposed on the outer sides of the substrates (6 and 7), and at least one phase difference plate (1) (optical compensation layer) having negative refractive index anisotropy in one axis direction being disposed at least between a substrate (6) and a polarizing plate (3), and the axis of the compensation layer (1) being parallel to at least one of the polarization axes of the two polarizing plates (3 and 4), and any projection direction of the anisotropic axis of the optical compensation layer would have same direction according to a certain viewing angle, i.e., in a certain viewing angle the projection direction of the anisotropic axis of the optical compensation layer would be parallel to at least one of the polarization axes of the two polarizing plates (3 and 4) too, so that the birefringence to compensate for the change of

phase difference of normal light and abnormal light caused by viewing angle, thereby making it possible to convert into linear polarization in a wide range of viewing angle.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange an optical compensation layer as claimed in claim 7 for achieving a wide viewing angle.

6. Claims 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Utsumi and Yamahara as applied to claim 7 above, and further in view of US 4,844,569 (Wada et al).

Claims 8-9 and 13, Wada discloses (col.5, line 47 - col.7, line 47; Fig.7) that by providing an optical anisotropic substance (102) (optical compensation layer) which compensates for the elliptical polarization of light passing through cell (103), the intensity of light passing through optical anisotropic layer (102) are substantially the same as the light entering cell (103), namely linear polarized light, so that is the directors of the liquid crystal molecules in the liquid crystal layer with respect to a plane of the liquid crystal layer are substantially uniform, and the refractive index anisotropic axis of the optical compensation layer extends substantially in parallel to the directors, so that without loss brightness or intensity of light.

Wada also discloses (col.7, lines 12-25) that the product of birefringence (Δn) and layer thickness (d) that is, $\Delta n \cdot d$ for both cell (103) and substance (102) (optical compensation layer) is the same, i.e., the $\Delta n_{LC} \cdot d_{LC} = \Delta n_F \cdot d_F$, and that is the perfect compensation. .

Wada indicates (col.6, lines 26-65) that the optical anisotropic layer (102) rotates light having the elliptically polarized waves to cancel the differences between their polarized states by

again linearly polarizing all wavelength as represented by blue light, green light and red light, so that without loss of brightness or intensity of light.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange the optical compensation as claimed in claim 8-9 and 13 for achieving high contrast as without loss brightness or intensity of light.

Claims 10 and 14-15, if the perfect compensation achieved, as a result, the refractive index n_{LO} of the liquid crystal layer for the ordinary light must ~~would~~ equal to the refractive index n_{FO} of the compensation layer.

Therefore, the limitation as claimed in claims 10 and 14-15 would have been at least obvious.

Claims 11-12, if the perfect compensation achieved, as a result, the projections of directors of liquid crystal molecules must ~~would~~ be parallel to each other and the projection of the refractive index anisotropic axis of the compensation layer would be parallel to the directors of the plane of the liquid crystal layer, and the angles relationship would be $\theta_1 < \theta_F < \theta_2$, and the refractive index anisotropic axis of the compensation layer would be parallel to the director of one of the liquid crystal molecules, and the angle θ_F would vary in the thicknesswise direction of the compensation layer in corresponding to the director in thicknesswise direction of the liquid crystal layer.

Therefore, the limitation as claimed in claims 11-12 would have been at least obvious.

Response to Arguments

7. Applicant's arguments filed on Oct.16, 2002 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

1) Claim 1, Shimizu has nothing to do with the level of driving voltage applied to the pixel electrodes, and Ogawa does not disclose or suggest an active matrix liquid crystal display panel configured for "applying different driving voltages to the pixel electrodes, depending upon the different thickness of the crystal layers in each of the color layers".

2) Claims 3 and 5, Utsumi does not disclose or suggest "the pixel electrodes and the
PX CT
opposing electrodes being spaced from each other by distance which are different for the individual color layers".

3) Claim 7, Yamahara does not disclose or suggest that the phase different plate has a negative refrative index anisotripy in any axis direction, and the projection of the direction of theaxis having a negative index anisotropy is parallel to the polarization axis of the polarizers, and Wade does not disclose or suggest "an optical compensation layer having a negative index anisotropy in one axis direction, a projection of the anisotropic axis of the optical compensation layer on a plane of one of the substrates being parallel to at least one of polarization axes of the two polarizing plates".

Examiner's responses to Applicant's **only** arguments are as follows:

1) Claim 1, Shimizu discloses (col.1, line 45 - col.2, line 33; Fig.1) that the liquid crystal layer having a thickness which varies depending upon the transmission wavelengths of the color filters, so as to improve the contrast, and this is "multi-gap", and the color filter can give a pattern having a high precision, an excellent surface smoothness, and a good environmental resistance, so that the coloring is controlled, and in case of an oblique view or front view will have a good environmental resistance and a wide viewing angle.

Ogawa discloses (col.7, line 3 - col.8, line 7; col.9, line 48 - col. 10, line 26; Fig.15) that in the relative thick cell, there is a undesirable phenomenon that the transmittance decreases as impressed voltage increased. Therefore, in the thick cell, the impressed voltage must be decreased in order to increase the transmittance. Therefore, the applied driving voltages to the pixel electrodes must be decreased as the cell thickness being increased in order to increase the brightness, and that would be applying driving voltages to the pixel electrodes are depending upon the thickness of the crystal layers in each coloe layer, wherein the applied driving voltages to each coloe pixel electrode are increased as the thickness of the liquid crystal layer of each coloe pixel layer being decreased for achieving maximum brightness of each color (i.e., larger voltage is applied to each of the pixel electrodes for the color layers with thinner liquid crystal layer ti get maximum brightness for each color).

Ogawa discloses the concept for the multi-gap type liquid crystal cell in which applying different driving voltage to the pixel electrodes depending upon the different thickness of liquid crystal layer in each color layer , wherein the applied driving voltages to each coloe pixel

electrode are increased as the thickness of the liquid crystal layer of each coloe pixel layer being decreased for achieving maximum brightness of each color.

2) Claims 3 and 5, Utsumi discloses (col.11, lines 25-43; Fig.6) the IPS display device comprising color filters (R,B,G) corresponding to the pixel electrodes. Since each of the pixel electrodes is corresponding to a different color filter (i.e., R, B or G), so that the respective pixel electrodes and the opposing common electrodes being spaced from each other by distances which are different for the individual color filters (different color filter having corresponding different pixel electrode, so that the distance between the pixel electrode and the common electrode also is different corresponding to each color filter). Utsumi indicates (col.5, lines 33 - 67) that such structure would suppress the sudden decrease of the transmittance at the short wavekengh region or the blue region and obtaining the fine display charaterstic.

3) Claim 7, Yamahara discloses (col.3, lines 30-57; col.5, lines 30-31; Figs. 2, 4) that a pair of polarizing plates (3 and 4) disposed on the outer sides of the substrates (6 and 7), and at least one phase difference plate (1) (optical compensation layer) having negative refractive index anisotropy in one axis direction being disposed at least between a substrate (6) and a polarizing plate (3), and the axis of the compensation layer (1) being parallel to the polarization axes of the polarizing plates (4) (Fig.4), and any projection direction of the anisotropic axis of the optical compensation layer would have same direction according to a certain viewing angle, i.e., in a certain viewing angle, the projection direction of the anisotropic axis of the optical compensation layer would be parallel to at least one of the polarization axes of the two polarizing plates (3 and

4) too, so that the birefringence to compensate for the change of phase difference of normal light and abnormal light caused by viewing angle, thereby making it possible to convert into linear polarization in a wide range of viewing angle.

The reference Wade discloses the limitations in claims 8-9 and 13, such as that Wada discloses (col.5, line 47 - col.7, line 47; Fig.7) that by providing an optical anisotropic substance (102) (optical compensation layer) which compensates for the elliptical polarization of light passing through cell (103), the intensity of light passing through optical anisotropic layer (102) are substantially the same as the light entering cell (103), namely linear polarized light, so that is the directors of the liquid crystal molecules in the liquid crystal layer with respect to a plane of the liquid crystal layer are substantially uniform, and the refractive index anisotropic axis of the optical compensation layer extends substantially in parallel to the directors, so that without loss brightness or intensity of light. Wada also discloses (col.7, lines 12-25) that the product of birefringence (Δn) and layer thickness (d) that is, $\Delta n \cdot d$ for both cell (103) and substance (102) (optical compensation layer) is the same, i.e., the $\Delta n_{LC} \cdot d_{LC} = \Delta n_F \cdot d_F$, and that is the perfect compensation. Wada indicates (col.6, lines 26-65) that the optical anisotropic layer (102) rotates light having the elliptically polarized waves to cancel the differences between their polarized states by again linearly polarizing all wavelength as represented by blue light, green light and red light, so that without loss of brightness or intensity of light.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703)308-6213 .

Mike Qi
December 18, 2002

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